threshold for defining presence of SBA in a subregion (score ⩾2), as well as categorized as absent (score = 0), score = 1, and score ⩾2.
Results: For these analyses, 459 knees met inclusion criteria (45% with SBA present in ⩾1 subregion; participants' mean age was 63, mean BMI 30.5% and 65% were female). Baseline presence of SBA was associated with an OR of 7.5 (95% CI 5.6−9.9, p < 0.0001) for having cartilage loss over 30 months in the same subregion compared to subregions without any baseline SBA. Compartment-specific results were similar: SBA was associated with an OR of 5.4 (95% CI 3.6−8.1, p < 0.0001) for cartilage loss in the medial compartment (n = 330 knees) and an OR of 5.5 (95% CI 2.4−12.7, p < 0.0001) for cartilage loss in the lateral compartment (n = 196 knees). Similar results were obtained with the higher threshold definition for baseline presence of SBA in a subregion [OR of 3.3 (95% CI 1.9−5.7, p < 0.0001)], and when SBA was categorized into three levels [ORs were 5.4 (95% CI 3.0−9.7, p < 0.0001) and 7.3 (95% CI 5.5−9.8, p < 0.0001) for subregions with an SBA score = 1 and score ⩾2, respectively, compared to subregions with no SBA at baseline (p < 0.0001 for linear trend)].
Conclusions: SBA is strongly associated with cartilage loss over time occurring within the same subregion of a knee. SBA may directly influence overlying cartilage loss or it may serve as a marker of an area undergoing great compressive stress and in which cartilage loss is inevitable. Further study of SBA may provide additional insight into the relationship of bone and cartilage loss in OA.

398 MRI BASED MORPHOLOGIC GRADING SYSTEM FOR EARLY HIP OSTEOARTHRITIS

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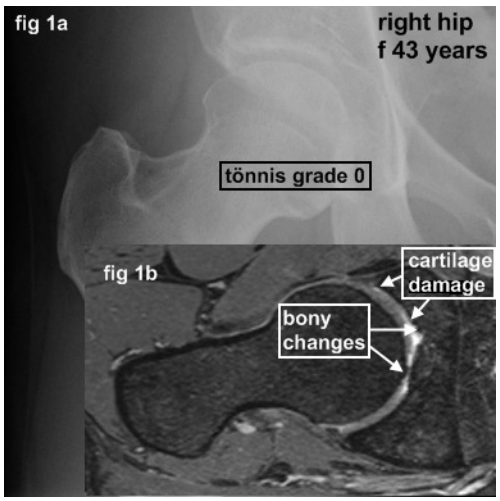
Purpose: The aim of this study is to develop a MRI grading system for hip osteoarthritis (OA) based on morphologic changes in cartilage, labrum, and bone.
Methods: We devised a MRI grading system for early hip OA with standard definitions of morphologic changes with corresponding pictorial atlas. 50 MR images were obtained from 25 patients with hip dysplasia and 25 patients with femoroacetabular impingement. Images were acquired on a Siemens Avanto 1.5T scanner. Trufisp imaging with FoV 140 mm, matrix size 384, slice thickness 0.6 mm were used for morphologic grading. Three-dimensional dGEMRIC scan was obtained using two angle fast T1 mapping sequence. Additionally, standard pelvic radiographs and WOMAC outcome scores were obtained. The trufisp images were reconstructed in 6 radial projections rotating around the femoral neck axis. These radial images were scored for bone and soft tissue lesions at 7 different positions encompassing most of the articular surface and avoiding the acetabular fossa. A sum score of all lesions seen in the joint was calculated. The sum score (OA score) ranges from 0 to 197 with higher score indicating more OA. We looked at correlations between OA score, Tönnis grade, joint space width (JSW), dGEMRIC index, and WOMAC pain using Spearman rank correlation.



Results: Mean age of the patients was 29 years. Fig1 shows an example of hip with no radiograph OA (fig 1a). On MRI, this hip had cartilage damage and bony changes (fig 1b). The OA score ranged from 20 to 87 with mean value of 43. Significant correlation was found between OA score and Tönnis grade (r_s=0.39, p = 0.006), dGEMRIC index (r_s = −0.35, p = 0.01), and WOMAC pain score (r_s = 0.48, p = 0.001) (fig 2). No correlation was found between OA score and JSW.
Conclusions: In this preliminary result, we attempted to score the bony and soft tissue morphologic changes that occur in early hip OA. We have found good correlation with clinical outcome measure and dGEMRIC index suggesting that this measure is potentially a clinically relevant measure. We are currently attempting to look at the reproducibility of this grading system as well as the local correlation between morphologic changes and local dGEMRIC index.

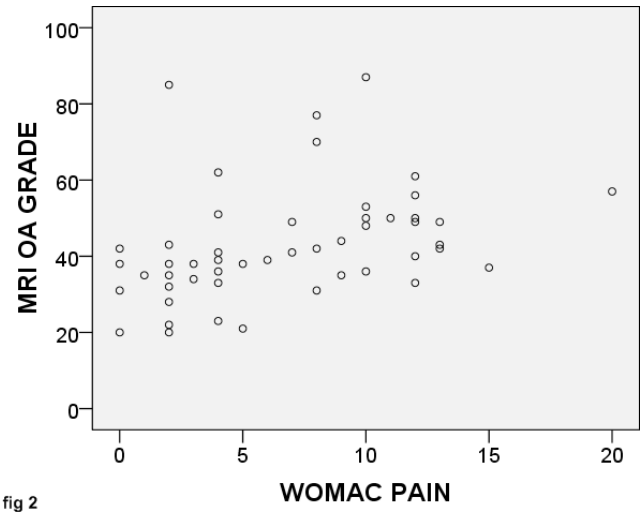


fig 2

399 IN VIVO DIFFERENTIATION OF NORMAL HYALINE CARTILAGE AND REPARATIVE TISSUE IN PATIENTS AFTER DIFFERENT CARTILAGE REPAIR PROCEDURES USING THREE-DIMENSIONAL, DELAYED GADOLINIUM-ENHANCED MRI OF CARTILAGE (DGEMRIC) AT 3 TESLA

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Purpose: To use a newly developed short 3D-GRE sequence with two flip angle excitation pulses for dGEMRIC to evaluate the relative glycosaminoglycan (GAG) content of repair tissue in patients after microfracturing (MFX) and matrix-associated autologous chondrocyte transplantation (MACT) of the knee joint.
Methods: In a phantom study, T1-mapping based on a 3D-GRE sequence with two flip angle excitation pulses was compared to a standard inversion recovery (IR) sequence at 3.0T for T1 values in the range of 200 to 1200 ms. Twenty patients treated with microfracture (MFX) or matrix-associated autologous chondrocyte transplantation (MACT) (ten in each group) were enrolled. For comparability, patients from each group were matched by age (MFX: 37.1±15.4 years; MACT: 37.7±8.9 years) and post-operative interval (MFX: 33.0±5.2 months; MACT: 32.0±13.1 months). The Δrelaxation rate (ΔR1) for repair tissue and normal hyaline cartilage and the relative Δrelaxation rate (ΔrR1) were calculated, and mean values were compared between both groups using an analysis of variance. Figure 1 shows an exemplary patient after MFX whereas figure 2 is visualizing a patient after MACT.
Results: The phantom study demonstrated a good correlation between dual flip angle excitation pulse 3D GRE and the IR sequence. The mean ΔR1 for MFX was 1.07±0.34 versus 0.32±0.20 at the intact control site, and for MACT, 1.90±0.49 compared to 0.87±0.44, which resulted in a relative ΔrR1 of 3.39 for MFX and 2.18 for MACT. The difference between the cartilage repair groups was statistically significant.
Conclusions: The new 3D, dual flip angle excitation pulse, GRE-based dGEMRIC technique is comparable to a standard T1 IR technique for T1 mapping, but reduces scan time to four minutes. The preliminary in vivo study demonstrates the feasibility of the technique for the evaluation of relative GAG content in patients after different cartilage repair surgeries.